

# SPEED CONTROL SYSTEM

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## DESCRIPTION AND OPERATION

## SPEED CONTROL SYSTEM

## DESCRIPTION

The speed control system is electronically controlled and vacuum operated. Electronic control of the speed control system is integrated into the Powertrain Control Module (PCM). The controls consist of two steering wheel mounted switches. The switches are labeled: ON/OFF, RES/ACCEL, SET, COAST, and CANCEL.

The system is designed to operate at speeds above 30 mph (50 km/h).

**WARNING: THE USE OF SPEED CONTROL IS NOT RECOMMENDED WHEN DRIVING CONDITIONS DO NOT PERMIT MAINTAINING A CONSTANT SPEED, SUCH AS IN HEAVY TRAFFIC OR ON ROADS THAT ARE WINDING, ICY, SNOW COVERED, OR SLIPPERY.**

## OPERATION

When speed control is selected by depressing the ON switch, the PCM allows a set speed to be stored in PCM RAM for speed control. To store a set speed, depress the SET switch while the vehicle is moving at a speed between 35 and 85 mph. In order for the speed control to engage, the brakes cannot be applied, nor can the gear selector be indicating the transmission is in Park or Neutral.

The speed control can be disengaged manually by:

- Stepping on the brake pedal
- Depressing the OFF switch

- Depressing the CANCEL switch.
- Depressing the clutch pedal (if equipped).

**NOTE: Depressing the OFF switch or turning off the ignition switch will erase the set speed stored in the PCM.**

For added safety, the speed control system is programmed to disengage for any of the following conditions:

- An indication of Park or Neutral
- A rapid increase rpm (indicates that the clutch has been disengaged)
- Excessive engine rpm (indicates that the transmission may be in a low gear)
- The speed signal increases at a rate of 10 mph per second (indicates that the coefficient of friction between the road surface and tires is extremely low)
- The speed signal decreases at a rate of 10 mph per second (indicates that the vehicle may have decelerated at an extremely high rate)

Once the speed control has been disengaged, depressing the RES/ACCEL switch (when speed is greater than 30 mph) restores the vehicle to the target speed that was stored in the PCM.

While the speed control is engaged, the driver can increase the vehicle speed by depressing the RES/ACCEL switch. The new target speed is stored in the PCM when the RES/ACCEL is released. The PCM also has a “tap-up” feature in which vehicle speed increases at a rate of approximately 2 mph for each momentary switch activation of the RES/ACCEL switch.

A “tap down” feature is used to decelerate without disengaging the speed control system. To decelerate

## DESCRIPTION AND OPERATION (Continued)

from an existing recorded target speed, momentarily depress the COAST switch. For each switch activation, speed will be lowered approximately 1 mph.

## SPEED CONTROL SERVO

### DESCRIPTION

The servo unit consists of a solenoid valve body, and a vacuum chamber. The solenoid valve body contains three solenoids:

- Vacuum
- Vent
- Dump

The vacuum chamber contains a diaphragm with a cable attached to control the throttle linkage.

### OPERATION

The Powertrain Control Module (PCM) controls the solenoid valve body. The solenoid valve body controls the application and release of vacuum to the diaphragm of the vacuum servo. The servo unit cannot be repaired and is serviced only as a complete assembly.

Power is supplied to the servo's by the PCM through the brake switch. The PCM controls the ground path for the vacuum and vent solenoids.

The dump solenoid is energized anytime it receives power. If power to the dump solenoid is interrupted, the solenoid dumps vacuum in the servo. This provides a safety backup to the vent and vacuum solenoids.

The vacuum and vent solenoids must be grounded at the PCM to operate. When the PCM grounds the vacuum servo solenoid, the solenoid allows vacuum to enter the servo and pull open the throttle plate using the cable. When the PCM breaks the ground, the solenoid closes and no more vacuum is allowed to enter the servo. The PCM also operates the vent solenoid via ground. The vent solenoid opens and closes a passage to bleed or hold vacuum in the servo as required.

The PCM duty cycles the vacuum and vent solenoids to maintain the set speed, or to accelerate and decelerate the vehicle. To increase throttle opening, the PCM grounds the vacuum and vent solenoids. To decrease throttle opening, the PCM removes the grounds from the vacuum and vent solenoids. When the brake is released, if vehicle speed exceeds 30 mph to resume, 35 mph to set, and the RES/ACCEL switch has been depressed, ground for the vent and vacuum circuits is restored.

## SPEED CONTROL SOLENOID CIRCUITS

### OPERATION

When all of the speed control parameters are met, and the SET button is pressed, the PCM actuates the vent solenoid and "duty-cycles" the vacuum solenoid to open the throttle and bring the vehicle up to target speed. When the vehicle is at target speed, it will actuate the vent solenoid with the vacuum solenoid de-activated to maintain the vehicle at target speed. When the vehicle is above target speed, the PCM will "duty-cycle" the vent solenoid with the vacuum solenoid still de-activated to close the throttle to return to target speed.

## SPEED CONTROL SWITCHES

### DESCRIPTION

There are two separate switch pods that operate the speed control system. The steering-wheel-mounted switches use multiplexed circuits to provide inputs to the PCM for ON, OFF, RESUME, ACCELERATE, SET, DECEL and CANCEL modes. Refer to the owner's manual for more information on speed control switch functions and setting procedures.

The individual switches cannot be repaired. If one switch fails, the entire switch module must be replaced.

### OPERATION

When speed control is selected by depressing the ON, OFF switch, the PCM allows a set speed to be stored in its RAM for speed control. To store a set speed, depress the SET switch while the vehicle is moving at a speed between approximately 35 and 85 mph. In order for the speed control to engage, the brakes cannot be applied, nor can the gear selector be indicating the transmission is in Park or Neutral.

The speed control can be disengaged manually by:

- Stepping on the brake pedal
- Depressing the OFF switch
- Depressing the CANCEL switch.

The speed control can be disengaged also by any of the following conditions:

- An indication of Park or Neutral
- The VSS signal increases at a rate of 10 mph per second (indicates that the co-efficient of friction between the road surface and tires is extremely low)
- Depressing the clutch pedal.
- Excessive engine rpm (indicates that the transmission may be in a low gear)
- The VSS signal decreases at a rate of 10 mph per second (indicates that the vehicle may have decelerated at an extremely high rate)
- If the actual speed is not within 20 mph of the set speed

## DESCRIPTION AND OPERATION (Continued)

The previous disengagement conditions are programmed for added safety.

Once the speed control has been disengaged, depressing the ACCEL switch restores the vehicle to the target speed that was stored in the PCM's RAM.

**NOTE: Depressing the OFF switch will erase the set speed stored in the PCM's RAM.**

If, while the speed control is engaged, the driver wishes to increase vehicle speed, the PCM is programmed for an acceleration feature. With the ACCEL switch held closed, the vehicle accelerates slowly to the desired speed. The new target speed is stored in the PCM's RAM when the ACCEL switch is released. The PCM also has a "tap-up" feature in which vehicle speed increases at a rate of approximately 2 mph for each momentary switch activation of the ACCEL switch.

The PCM also provides a means to decelerate without disengaging speed control. To decelerate from an existing recorded target speed, depress and hold the COAST switch until the desired speed is reached. Then release the switch. The ON, OFF switch operates two components: the PCM's ON, OFF input, and the battery voltage to the brake switch, which powers the speed control servo.

## BRAKE LAMP SWITCH

## DESCRIPTION

The switch is mounted on the brake pedal mounting bracket under the instrument panel.

## OPERATION

Vehicles equipped with the speed control option use a dual function brake lamp switch. The PCM monitors the state of the dual function brake lamp switch. Refer to the Brake section for more information on brake lamp switch service and adjustment procedures.

The brake switch is equipped with three sets of contacts, one normally open and the other two normally closed (brakes disengaged). The PCM sends a 12 volt signal to one of the normally closed contacts in the brake switch, which is returned to the PCM as a brake switch state signal. With the contacts closed, the 12 volt signal is pulled to ground causing the signal to go low. The low voltage signal, monitored by the PCM, indicates that the brakes are not applied. When the brakes are applied, the contacts open, causing the PCM's output brake signal to go high, disengaging the speed control, cutting off PCM power to the speed control solenoids.

The second set of normally closed contacts supplies 12 volts from the PCM any time speed control is turned on. Through the brake switch, current is

routed to the speed control servo solenoids. The speed control solenoids (vacuum, vent and dump) are provided this current any time the speed control is ON and the brakes are disengaged.

When the driver applies the brakes, the contacts open and current is interrupted to the solenoids. The normally open contacts are fed battery voltage. When the brakes are applied, battery voltage is supplied to the brake lamps.

## SERVO CABLE

## DESCRIPTION

The speed control servo cable is connected between the speed control vacuum servo diaphragm and the throttle body control linkage.

## OPERATION

This cable causes the throttle control linkage to open or close the throttle valve in response to movement of the vacuum servo diaphragm.

## VACUUM RESERVOIR

## DESCRIPTION

The vacuum reservoir is a plastic storage tank connected to an engine vacuum source by vacuum lines.

## OPERATION

The vacuum reservoir is used to supply the vacuum needed to maintain proper speed control operation when engine vacuum drops, such as in climbing a grade while driving. A one-way check valve is used in the vacuum line between the reservoir and the vacuum source. This check valve is used to trap engine vacuum in the reservoir. On certain vehicle applications, this reservoir is shared with the heating/air-conditioning system. The vacuum reservoir cannot be repaired and must be replaced if faulty.

## VEHICLE SPEED INPUT

## OPERATION

The Vehicle Speed Sensor (VSS) is no longer used for any Dodge Truck.

Vehicle speed and distance covered are measured by the Rear Wheel Speed Sensor. The sensor is mounted to the rear axle. A signal is sent from this sensor to the Controller Antilock Brake (CAB) computer. A signal is then sent from the CAB to the Powertrain Control Module (PCM) to determine vehicle speed and distance covered. The PCM will then determine strategies for speed control system operation.

## DIAGNOSIS AND TESTING

### ROAD TEST

Perform a vehicle road test to verify reports of speed control system malfunction. The road test should include attention to the speedometer. Speedometer operation should be smooth and without flutter at all speeds.

Flutter in the speedometer indicates a problem which might cause surging in the speed control system. The cause of any speedometer problems should be corrected before proceeding. Refer to Group 8E, Instrument Panel and Gauges for speedometer diagnosis.

If a road test verifies a system problem and the speedometer operates properly, check for:

- A Diagnostic Trouble Code (DTC). If a DTC exists, conduct tests per the Powertrain Diagnostic Procedures service manual.
- A misadjusted brake (stop) lamp switch. This could also cause an intermittent problem.
- Loose, damaged or corroded electrical connections at the servo. Corrosion should be removed from electrical terminals and a light coating of Mopar MultiPurpose Grease, or equivalent, applied.
- Leaking vacuum reservoir.
- Loose or leaking vacuum hoses or connections.
- Defective one-way vacuum check valve.
- Secure attachment of both ends of the speed control servo cable.
- Smooth operation of throttle linkage and throttle body air valve.
- Failed speed control servo. Do the servo vacuum test.

**CAUTION:** When test probing for voltage or continuity at electrical connectors, care must be taken not to damage connector, terminals or seals. If these components are damaged, intermittent or complete system failure may occur.

### VACUUM SUPPLY TEST

(1) Disconnect vacuum hose at speed control servo and install a vacuum gauge into the disconnected hose.

(2) Start engine and observe gauge at idle. Vacuum gauge should read at least ten inches of mercury.

(3) If vacuum is less than ten inches of mercury, determine source of leak. Check vacuum line to engine for leaks. Also check actual engine intake manifold vacuum. If manifold vacuum does not meet this requirement, check for poor engine performance and repair as necessary.

(4) If vacuum line to engine is not leaking, check for leak at vacuum reservoir. To locate and gain access to reservoir, refer to Vacuum Reservoir Removal/Installation in this group. Disconnect vacuum line at reservoir and connect a hand-operated vacuum pump to reservoir fitting. Apply vacuum. Reservoir vacuum should not bleed off. If vacuum is being lost, replace reservoir.

(5) Verify operation of one-way check valve and check it for leaks.

(a) Locate one-way check valve. The valve is located in vacuum line between vacuum reservoir and engine vacuum source. Disconnect vacuum hoses (lines) at each end of valve.

(b) Connect a hand-operated vacuum pump to reservoir end of check valve. Apply vacuum. Vacuum should not bleed off. If vacuum is being lost, replace one-way check valve.

(c) Connect a hand-operated vacuum pump to vacuum source end of check valve. Apply vacuum. Vacuum should flow through valve. If vacuum is not flowing, replace one-way check valve. Seal the fitting at opposite end of valve with a finger and apply vacuum. If vacuum will not hold, diaphragm within check valve has ruptured. Replace valve.

## REMOVAL AND INSTALLATION

### SPEED CONTROL SERVO

#### REMOVAL

- (1) Disconnect negative battery cable at battery.
- (2) Disconnect vacuum hose (line) at servo (Fig. 1).
- (3) Disconnect electrical connector at servo.
- (4) Disconnect servo cable at throttle body. Refer to Servo Cable Removal/Installation in this group.

(5) Remove 2 mounting nuts holding servo cable sleeve to bracket (Fig. 1) or (Fig. 2).

(6) Pull speed control cable sleeve and servo away from servo mounting bracket to expose cable retaining clip (Fig. 2) and remove clip. Note: The servo mounting bracket displayed in (Fig. 2) is a typical bracket and may/may not be applicable to this model vehicle.

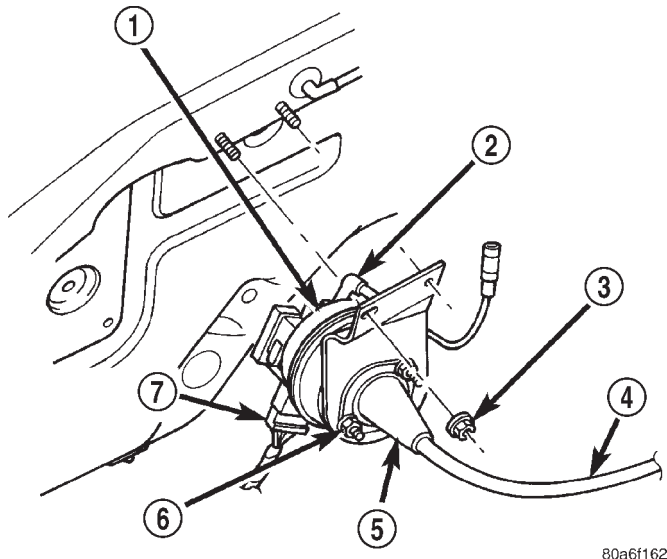
(7) Remove servo from mounting bracket. While removing, note orientation of servo to bracket.

#### INSTALLATION

- (1) Position servo to mounting bracket.
- (2) Align hole in cable connector with hole in servo pin. Install cable-to-servo retaining clip.
- (3) Insert servo mounting studs through holes in servo mounting bracket.
- (4) Install servo mounting nuts and tighten to 8.5 N·m (75 in. lbs.).
- (5) Connect vacuum line at servo.



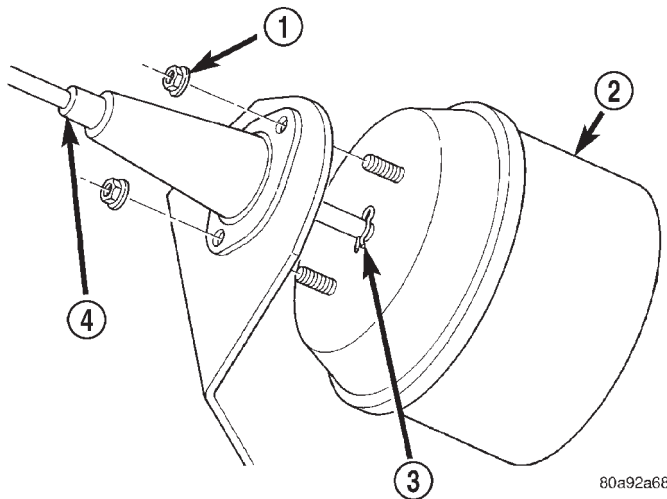
## REMOVAL AND INSTALLATION (Continued)



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**Fig. 1 Speed Control Servo Location**

- 1 - SPEED CONTROL SERVO
- 2 - VACUUM HOSE
- 3 - SERVO BRACKET NUTS (2)
- 4 - SERVO CABLE
- 5 - CABLE SLEEVE
- 6 - SERVO MOUNTING NUTS (2)
- 7 - ELECTRICAL CONNECTOR



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**Fig. 2 Servo Cable Clip Remove/Install—Typical**

- 1 - SERVO MOUNTING NUTS (2)
- 2 - SERVO
- 3 - CABLE RETAINING CLIP
- 4 - SERVO CABLE AND SLEEVE

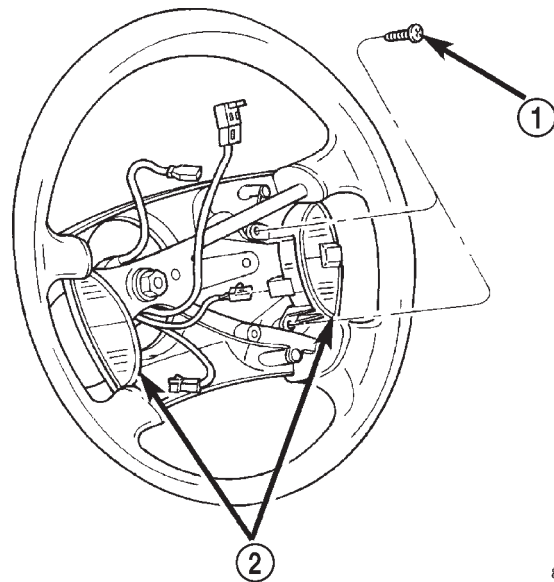
- (6) Connect electrical connector at servo.
- (7) Connect servo cable to throttle body. Refer to Servo Cable Removal/Installation in this group.
- (8) Connect negative battery cable to battery.
- (9) Before starting engine, operate accelerator pedal to check for any binding.

## SPEED CONTROL SWITCHES

## REMOVAL

**WARNING: BEFORE BEGINNING ANY AIRBAG SYSTEM COMPONENT REMOVAL OR INSTALLATION, REMOVE AND ISOLATE THE NEGATIVE (-) CABLE FROM THE BATTERY. THIS IS THE ONLY SURE WAY TO DISABLE THE AIRBAG SYSTEM. THEN WAIT TWO MINUTES FOR SYSTEM CAPACITOR TO DISCHARGE BEFORE FURTHER SYSTEM SERVICE. FAILURE TO DO THIS COULD RESULT IN ACCIDENTAL AIRBAG DEPLOYMENT AND POSSIBLE INJURY.**

- (1) Disconnect and isolate negative battery cable.
- (2) Remove airbag module. Refer to Group 8M, Passive Restraint Systems for procedures.
- (3) Remove switch-to-steering wheel mounting screws (Fig. 3).
- (4) Remove switch.
- (5) Remove electrical connector at switch.



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**Fig. 3 Speed Control Switches**

- 1 - MOUNTING SCREWS (2)
- 2 - SPEED CONTROL SWITCHES (2)

## INSTALLATION

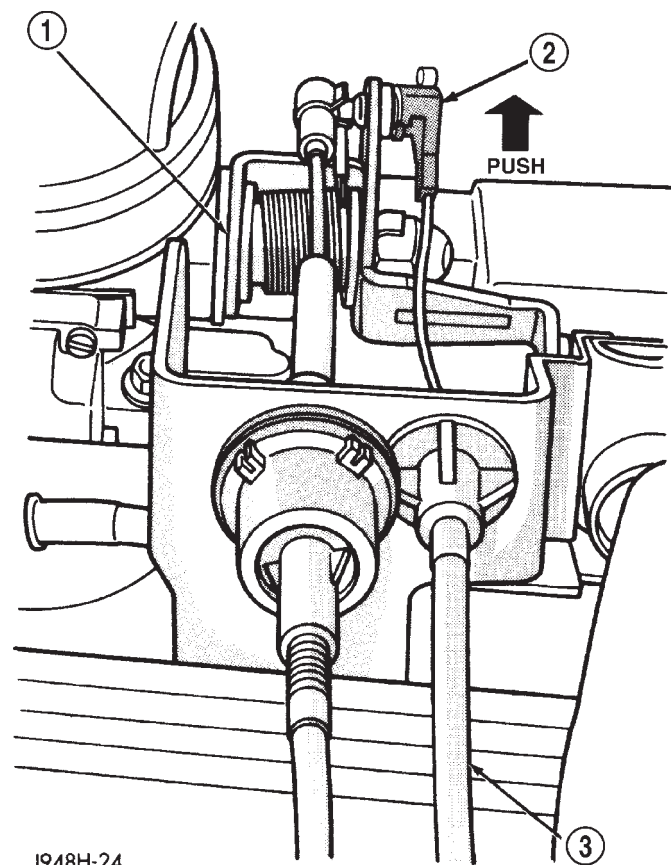
- (1) Install electrical connector to switch.
- (2) Install switch and mounting screws.
- (3) Tighten screws to 1.5 N·m (14 in. lbs.) torque.
- (4) Install airbag module. Refer to Group 8M, Passive Restraint Systems for procedures.
- (5) Connect negative battery cable.

## REMOVAL AND INSTALLATION (Continued)

## SERVO CABLE (EXCEPT 4.7L ENGINE)

## REMOVAL

- (1) Disconnect negative battery cable at battery.
- (2) Using finger pressure only, remove speed control cable connector at throttle body bellcrank by pushing connector off the bellcrank pin (Fig. 4) or (Fig. 5). **DO NOT try to pull connector off perpendicular to the bellcrank pin. Connector will be broken.**



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**Fig. 4 Cable Connection at Throttle Body—2.5L Engine**

- 1 - BELLCRANK  
2 - CABLE CONNECTOR  
3 - SPEED CONTROL CABLE

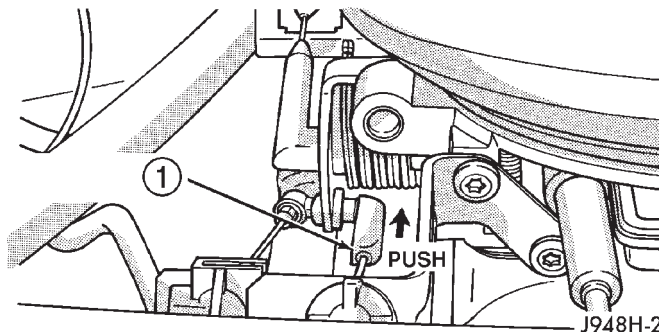
- (3) 2.5L Engine: Remove cable from cable guide at top of valve cover.

- (4) Squeeze 2 tabs on sides of speed control cable at throttle body mounting bracket (locking plate) and push out of bracket.

- (5) Remove servo cable from servo. Refer to Speed Control Servo Removal/Installation in this group.

## INSTALLATION

- (1) Install end of cable to speed control servo. Refer to Speed Control Servo Removal and Installation in this group.



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**Fig. 5 Cable Connection at Throttle Body—3.9L/5.2L/5.9L Engines**

- 1 - VEHICLE SPEED CONTROL CABLE

- (2) Install cable into throttle body mounting bracket (snaps in).

- (3) Install speed control cable connector at throttle body bellcrank pin (snaps on).

- (4) 2.5L Engine: Install cable to cable guide at top of valve cover.

- (5) Connect negative battery cable at battery.

- (6) Before starting engine, operate accelerator pedal to check for any binding.

## SERVO CABLE—4.7L V-8 ENGINE

## REMOVAL

- (1) Disconnect negative battery cable at battery.

- (2) Remove air box housing from throttle body.

The accelerator cable must be partially removed to gain access to speed control cable.

- (3) Using finger pressure only, disconnect accelerator cable connector at throttle body bellcrank pin by pushing connector off bellcrank pin towards front of vehicle (Fig. 6). **DO NOT try to pull connector off perpendicular to the bellcrank pin. Connector will be broken.**

- (4) Lift accelerator cable from top of cable cam (Fig. 6).

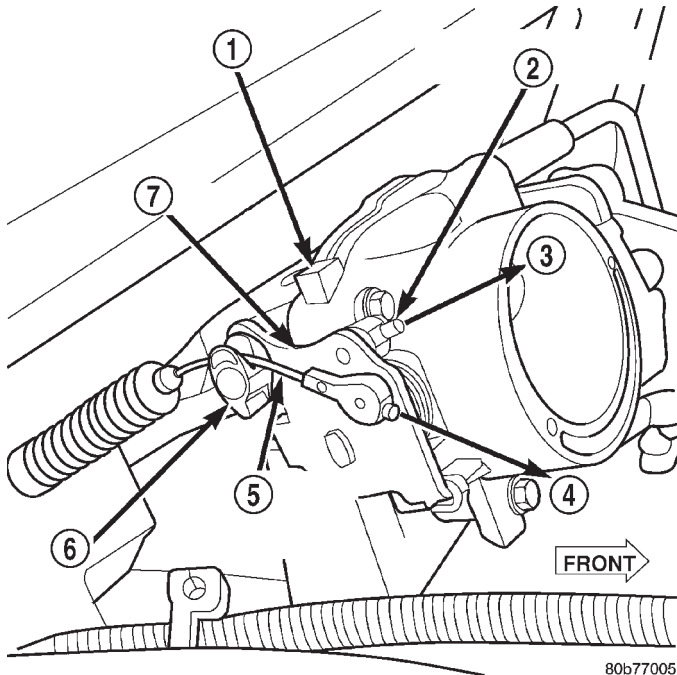
- (5) Press tab (Fig. 7) to release plastic cable mount from bracket. **Press on tab only enough to release cable from bracket. If tab is pressed too much, it will be broken.** Slide plastic mount (Fig. 7) towards passenger side of vehicle to remove cable from bracket.

- (6) Using finger pressure only, disconnect speed control cable connector at throttle body bellcrank pin by pushing connector off bellcrank pin towards front of vehicle (Fig. 6). **DO NOT try to pull connector off perpendicular to the bellcrank pin. Connector will be broken.**

- (7) Slide speed control cable plastic mount towards passenger side of vehicle to remove cable from bracket (Fig. 8).

## REMOVAL AND INSTALLATION (Continued)

(8) Remove servo cable from servo. Refer to Speed Control Servo Removal/Installation.



**Fig. 6 Cable Connectors at Bell Crank—4.7L V-8 Engine**

- 1 - THROTTLE BODY
- 2 - SPEED CONTROL CABLE CONNECTOR
- 3 - OFF
- 4 - OFF
- 5 - ACCELERATOR CABLE CONNECTOR
- 6 - CABLE CAM
- 7 - BELLCRANK

## INSTALLATION

(1) Install end of cable to speed control servo. Refer to Speed Control Servo Removal/Installation.

(2) Slide speed control cable plastic mount into bracket.

(3) Install speed control cable connector onto throttle body bellcrank pin (snaps on).

(4) Slide accelerator cable plastic mount into bracket. Continue sliding until tab (Fig. 7) is aligned to hole in mounting bracket.

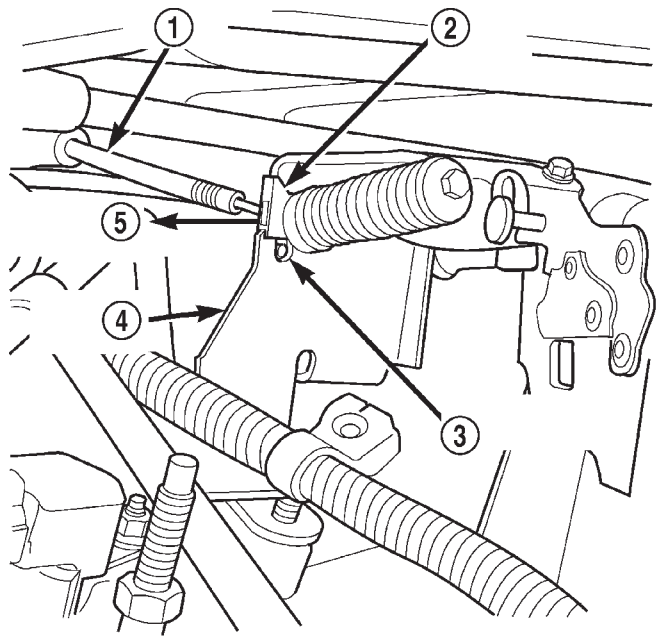
(5) Route accelerator cable over top of cable cam (Fig. 6).

(6) Install accelerator cable connector onto throttle body bellcrank pin (snaps on).

(7) Install air box housing to throttle body.

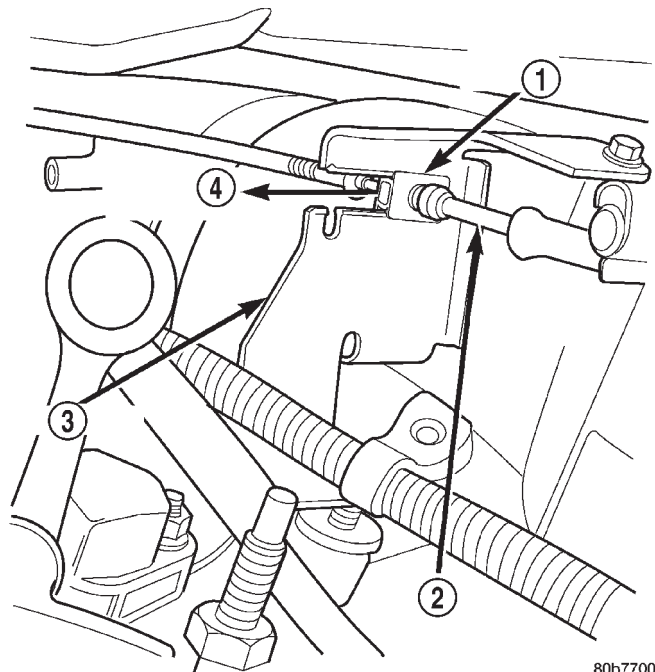
(8) Connect negative battery cable at battery.

(9) Before starting engine, operate accelerator pedal to check for any binding.



**Fig. 7 Accelerator Cable Release Tab—4.7L V-8 Engine**

- 1 - ACCELERATOR CABLE
- 2 - PLASTIC CABLE MOUNT
- 3 - PRESS TAB FOR REMOVAL
- 4 - CABLE BRACKET
- 5 - SLIDE FOR REMOVAL



**Fig. 8 Speed Control Cable at Bracket—4.7L V-8 Engine**

- 1 - PLASTIC CABLE MOUNT
- 2 - SPEED CONTROL CABLE
- 3 - BRACKET
- 4 - SLIDE FOR REMOVAL

## REMOVAL AND INSTALLATION (Continued)

**VACUUM RESERVOIR**

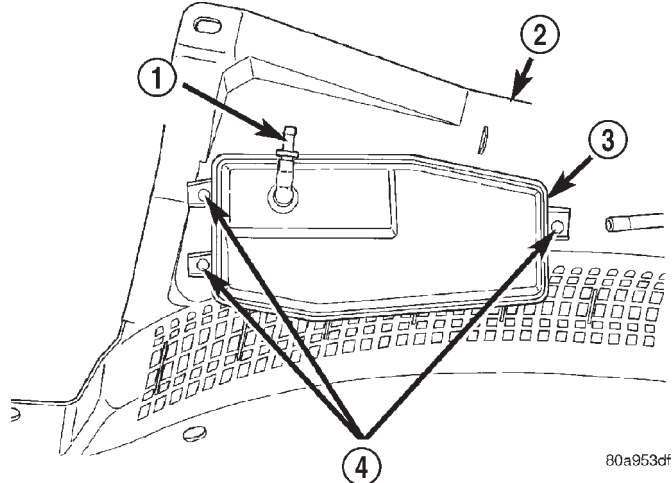
The vacuum reservoir is located under the plastic cowl plenum cover at lower base of windshield (Fig. 9) or (Fig. 11).

**REMOVAL**

(1) Disconnect and isolate negative battery at cable.

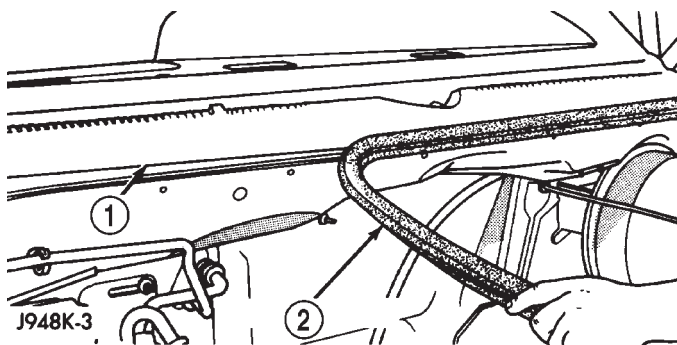
(2) Remove both windshield wiper arm/blade assemblies. Refer to Group 8K, Wiper and Washer Systems.

(3) Remove rubber weather-strip at front edge of cowl grill (Fig. 10).



**Fig. 9 Vacuum Reservoir Mounting**

- 1 - VACUUM SUPPLY CONNECTOR
- 2 - COWL PLENUM COVER/GRILLE PANEL
- 3 - VACUUM RESERVOIR
- 4 - SCREWS



**Fig. 10 Cowl Grille Panel Weather-strip**

- 1 - COWL GRILLE
- 2 - WEATHERSTRIP

(4) Remove four plastic nuts securing cowl plenum cover/grille panel to studs on cowl top panel near base of windshield (Fig. 11).

(5) Remove two plastic rivets securing each side of the cowl plenum cover/grille panel to cowl plenum panel and cowl top panel.

(6) Lift cowl plenum cover/grille panel from vehicle far enough to access windshield washer and vacuum plumbing near right end of cowl plenum.

(7) Disconnect windshield washer supply hose at in-line connector.

(8) Disconnect vacuum supply hose from vacuum supply connector at vacuum reservoir (Fig. 9).

(9) Remove cowl plenum cover/grille panel from vehicle.

(10) Remove three reservoir mounting screws (Fig. 9).

(11) Remove vacuum reservoir from vehicle.

**INSTALLATION**

(1) Install vacuum reservoir and three mounting screws to plastic cowl cover. Tighten three screws to 2.2 N-m (20 in. lbs.) torque.

(2) Position cowl plenum cover/grille panel to vehicle.

(3) Connect vacuum supply hose to vacuum reservoir.

(4) Connect windshield washer supply hose at in-line connector.

(5) Install and tighten cowl cover fasteners to vehicle body.

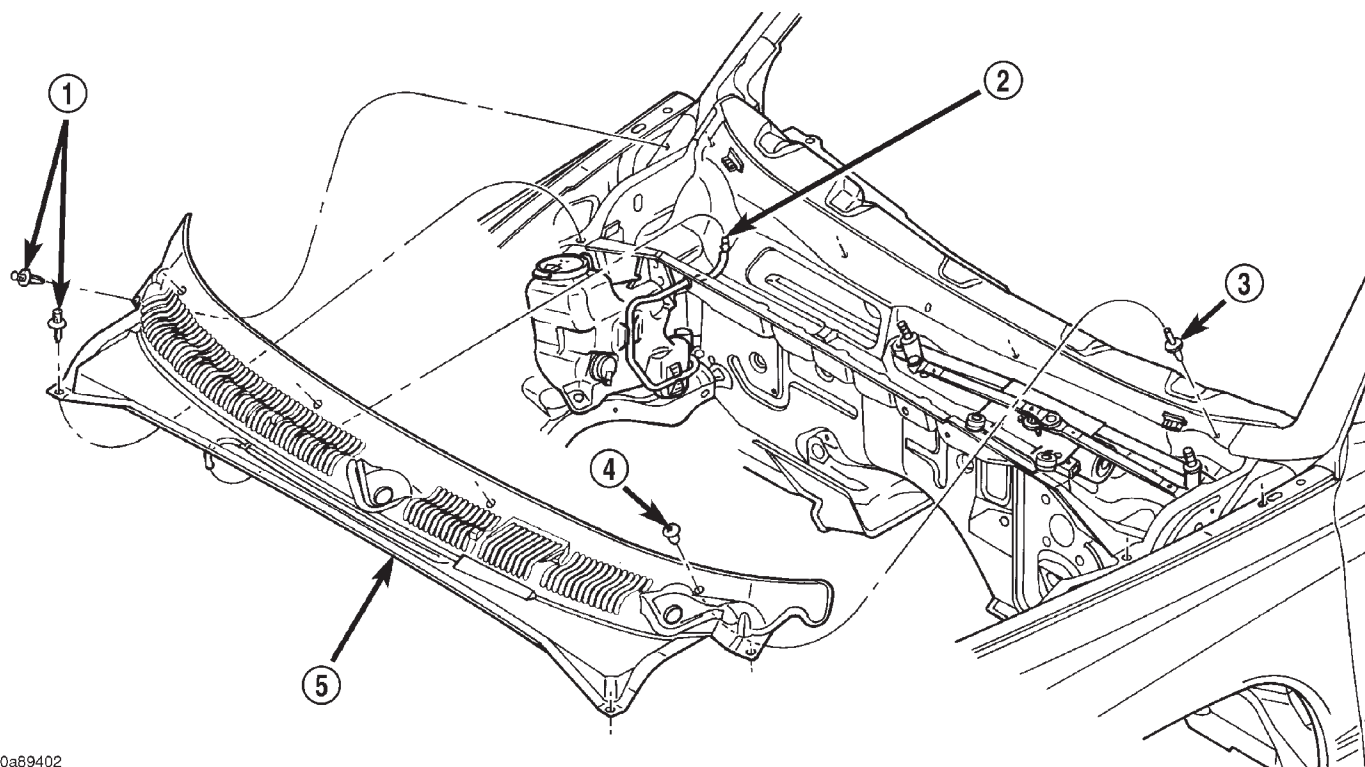
(6) Install rubber weather-strip at front edge of cowl grill.

(7) Install windshield wiper arms. Refer to Group 8K, Wiper and Washer Systems.

(8) Connect negative battery to cable.



## REMOVAL AND INSTALLATION (Continued)



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**Fig. 11 Cowl Plenum Cover/Grille Panel Remove/Install**

- |                                          |                                    |
|------------------------------------------|------------------------------------|
| 1 – PLASTIC RIVET                        | 4 – PLASTIC NUT                    |
| 2 – IN-LINE WASHER SUPPLY HOSE CONNECTOR | 5 – COWL PLENUM COVER/GRILLE PANEL |
| 3 – STUD                                 |                                    |

## SPECIFICATIONS

## TORQUE CHART

Description	Torque
Servo Mounting Bracket-to-Servo	
Nuts . . . . .	8.5 N·m (75 in. lbs.)
Servo Mounting Bracket-to-Body	
Nuts . . . . .	7–10 N·m (63–94 in. lbs.)
Switch Module Mounting	
Screws . . . . .	1.5 N·m (14 in. lbs.)
Vacuum Reservoir Mounting	
Screws . . . . .	2.2 N·m (20 in. lbs.)

